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MEMORY, IMAGINATION, LEARNING, AND THE HIGHER
MENTAL PROCESSES (EXPERIMENTAL)¹

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I. MEMORY AND IMAGINATION

(a) *Summaries and Systematic Treatises.*—Several years ago Professor G. E. Müller (38) began an investigation of a most remarkable case of supra-normal memory. During the progress of the experiments the author has been led far beyond the specific problem which he set himself at the outset; and we are promised a three-volume treatise describing and discussing the experimental findings, together with an evaluation of various points dealing with experimental procedure and a critical consideration of numerous questions which bear upon memorial and ideational theory. Colvin's book (11) is essentially a summary of the results which have been yielded from various investigations of the *Lernprozess*, together with an indication of pedagogical applications. Starch (50) has compiled a number of judiciously selected experiments from the field of experimental pedagogy, to which he has added several ingenious variations of his own. Offner's monograph (39) has appeared in a second edition in essentially unchanged form.

Ranschburg's Innsbruck *Sammelreferat* (47) is a review of recent findings in the psychopathology of memory. He points out the crudities of Freud's interpretation of the phenomena in this field,

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and shows that the recognized principles of associative and reproductive inhibition, associative coëxcitation, and the like furnish a much more adequate explanation of the common defects of memory. The methods of investigating memory are described and discussed; and the memorial characteristics of normal and various types of abnormal subjects are presented.

(b) *Discussions of General Questions*.—Henry's monograph (17) is based upon an elaborate mathematical treatment of a meager group of experimental data. Memory and habit are to be regarded as wholly disparate phenomena. Memorial functions are never performed successfully at the first attempt,—the failure being due to the fact that one's idea of the act is at first imperfect, and becomes perfect only as the result of repetition. In the case of habit, however, the idea of the act to be performed is complete from the outset.

Bühler (6) describes a method employing spatial relationships for memorial material. A sheet of paper is divided into thirty-six small squares, the vertical and horizontal diameters of the sheet being indicated by heavy lines. Each small square stands in a definite relationship to each of the four large squares; and a total of 1,265 spatial relationships may be differentiated upon the sheet. A given relationship, indicated by the colored contents of certain squares, is presented, learned, and reproduced, with introspections. Fischer (13) outlines a programme for the investigation of creative imagination, which includes the following problems: a description of its sphere (play, empathy, fantasy); a determination of the boundaries of this sphere, and of its relation to the sphere of the real and serious; a classification of the typical forms of creative imagination.

Moede (37) discusses the use of the term memory in the biological sciences; he points out that the term has been divested of its essential characteristics by the biologists, who then apply it in this emasculated connotation to designate certain purely biological phenomena. Even the laws of heredity and of analogous biological phenomena are held by the author to be only superficially analogous to the characteristic laws of memory. Jesinghaus (22) résumés the traditional theories of memory, and discusses the phenomena of perseveration, forgetting, and feeling of familiarity.

(c) *Imagery*.—Angell's report (3) evaluates the various tests of imagery, and adds ingenious methods from his own laboratory. None of the purely objective tests prove to be trustworthy; the author's recommendations include a complete series of tests for the whole range of mental functioning. Feuchtwanger's paper (12) reports an

investigation of the same question. His problem was essentially a comparison of results obtained by introspective and objective methods.

Meumann (35) urges the consideration of a hitherto unrecognized factor in our enumeration of ideational types. Certain individuals are able to deal efficiently with ideational material only when the imagery from each sense department is present in isolation; they are unable to make use of joint imagery from different senses. Lipmann (31) believes that in our enumeration of types of apprehension we should differentiate, within the visual type, between those individuals who best apprehend size, position, color tone, etc.

Schaub (48) finds that images (visual, auditory, tactal) possess the attribute of intensity. The difference between image and sensation is not one of intensity, but rather one of texture and context, the image being incomplete, abbreviated, and without kinaesthetic context. Lobsien (32) reports a series of results from which he concludes that auditory memory is equally well developed in girls and in boys, and that it increases uniformly and progressively with increase of age.

(d) *Association and Inhibition.*—Langfeld (28) investigated the effect of alcohol (30 ccm., 95 per cent., in 60 ccm. water) and caffeine (6 gr. in capsule) upon association, reproduction and suppression. Pictures were shown, and the reagents were instructed that in their choice of a reaction-word they must not name the picture. Neither drug had any appreciable effect other than to decrease the association-time. The reagents did not translate the negative into positive instructions, *i. e.*, there was a distinct negative attitude, which was usually describable in terms of cortical set. Experiments with pathological patients revealed no deviation from normal accuracy of reproduction or normal power of suppression excepting in certain cases of dementia *præcox*. Jacobson (21) presented pairs of weights for comparison, and introduced intensive auditory stimuli in order to determine whether and to what extent it was possible to affect the judgment of the weights by thus inhibiting the sensation obtained from the comparative weight. In other experiments auditory stimuli were presented for comparison, and pressures constituted the distraction. It was found that pressures of moderate intensity are inhibited by simultaneous sounds and by other pressures, and that sounds of moderate intensity are inhibited by intensive simultaneous pressures. Increased attention to the inhibiting sensation increases the inhibition, while increased attention to the other sensation decreases

the inhibition. Hence what is called distraction of attention consists in an inhibitory influence of one sensation upon another; and degree of (subjective) intensity of sensation is a function of degree of attention.

Dauber (11a) found that the preferred association is related to the repeated association, and also to a number of other phenomena: the frequency with which the stimulus-word and the reaction-word occur in ordinary language; the phenomenon of clang association. Nonsense syllables tend to arouse meaningful reaction-words, in spite of instructions to react with nonsense words; and preferred associations appear in these responses to nonsense stimuli, indicating that preference is not merely a product of close associative connection between stimulus-word and reaction-word. Huber (19) investigated the influence of culture and environment upon the association-reaction, by repeating with a group of soldier reagents the experiments which had been made by Reinhold with school-girl reagents. The soldiers gave fewer preferred associations, more internal associations, more adjectival and definitive reaction-words. The author confirms Jung and Riklin's finding that uncultured reagents are more influenced by the meaning of the word and less by the word as such; and he concludes that the associations of a group of reagents is always influenced by the *milieu* of the group.

Foucault (15) brings forward empirical evidence, obtained in experiments with numbers and nonsense syllables, to show that association does not take place merely as the result of resemblance. Resemblance has no associative effect unless it is perceived as such by the observer; and when resemblance is perceived, we have a case not of mere association but of comparison and judgment. Resemblance therefore owes its potency to an intellectual act, and is *per se* no more efficacious than contrast and incompatibility, cause and effect, or means and end.

Levy-Suhl (29) aimed to determine whether the association-reactions of different forms of mental abnormality manifest typically different characteristics. Employing his data as a basis of classification, he divided his forty-four patients into four groups; and his psychological classification showed a remarkable agreement with a classification which had been based upon a clinical diagnosis. The first group gave an almost normal reaction; it included a convalescent case of exhaustion delirium and three cases of dementia paralytica. The second group (hyperprosexia) was characterized by a hypervigilance and a hypertenacity of attention; here appear ten cases of mania

and a (transitional) case of acute paranoia, together with five variants from the general group-type. The third group was characterized by selective hyperprosexia (sixteen cases of paranoia); and the fourth by hypervigilant reaction, with contamination and dissociation (four cases of dementia paralytica). Ley and Menzerath (30) also report the results of an investigation of various forms of mental abnormality, by means of the association-reaction but they supplement this method by introspection. They found that characteristic differences exist between the associations of normal and abnormal subjects; that the different forms of mental abnormality are each characterized by a typical sort of association-reaction; that the lengthened reaction is due to other causes than the presence of an emotional complex.

Woodworth and Wells (55) publish the report of the committee which was charged by the American Psychological Association with the evaluation and the standardization of association tests. The report consists essentially of a series of recommendations, with directions as to precautions to be observed and methods and materials to be employed. Wells (51) draws upon 12,000 observations in his discussion of certain properties of the free association-time. Women show greater individual variation, and greater variability from day to day, than men. The former give about twice as many judgment reactions, and fewer associations by subordination and superordination. Emotional coloring may cause lengthened reaction, but it is only one of many causes of associative obstruction; suppression, distraction, indecision, and the like, must all be taken into account. In another paper (52) Wells suggests the following categories for the classification of associations: egocentric; superordinate; contrast; speech habit; miscellaneous.

(e) *Learning and Forgetting*.—Abramowski (1) deals with the familiar phenomenon that one may fail to remember a datum while he remembers what it is not. This resistance of memorial lacunæ to being filled by erroneous data he refers to generic feelings, which he describes as being neither ideas nor definite feelings. Objects were placed upon the outstretched palms of blindfolded observers, who perceived them tactually either with concentrated or with distracted attention. In subsequent sittings, attempts were made to recognize the objects, various suggestions being introduced for the purpose of determining whether and to what degree erroneous suggestions would be resisted. The author concludes from these and from similar experiments in kinæsthetic perception that sensory impressions, even when divested of every intellectual element (by

distraction), are still retained in memory; and he finds in this fact a confirmation for his hypothesis of generic feelings. Joteyko (23) reports that in the learning of digits, syllables and words, her observers had recourse to various sorts of imaginal material, and that associated images were of prime importance. Pyle (45) found in his investigation of the immediate "substance" memory of twelve adults, that the rapid learner is more accurate than the slow learner, nor does the slow learner excel in immediate or in permanent retention.

Numerous investigators have reported that it is more economical to learn a given material as a whole than in piecemeal fashion. Is this equally true when the material is of excessive length? Pyle and Snyder (46) investigated this question, employing poetry as memory material, and assigning sections which varied in length from five to two hundred lines. They found that the *Ganzmethode* is invariably more economical, no matter how long the whole or the parts may be; and the saving is greater when the "wholes" are longer. They explain the disadvantage of the *Teilmethode* from the fact that it involves the formation of associations between the end of a section and the beginning of the same section, and the fact that the earlier sections are forgotten during the act of learning the later ones.

Ordahl (40) undertook to discover whether learning is aided by wholly or relatively unconscious factors, and whether the formation of a habit of whose existence one is unconscious can progress as well under distraction; and to discover what is the rôle of consciousness in the learning of simple tasks involving (a) almost no intellectual factor, (b) a complex coördination of motor impulses, (c) in learning of a purely intellectual character. Her experiments included the learning of nonsense syllables with unnoticed concomitants; the comparison of lifted weights, with and without distraction; writing in unusual ways; the mental multiplication of large numbers. It was found that: (1) unnoticed aids have no influence in the act of learning; (2) in learning simple muscular coördinations, where consciousness is normally focused on the end, learning can progress without consciousness either of the end or of the fact that one is learning, but a high degree of attention to the task gives better results than distracted attention; (3) in learning of every sort, both conscious and unconscious factors are present. Conscious control is most direct where the material is of an "intellectual" character. Consciousness is a corrective agent; it eliminates errors, improves on elements unconsciously developed, and organizes the whole procedure.

Can the different parts of speech be memorized and retained with equal facility? Busemann (7) employed nouns, adjectives, verbs, adverbs, and nonsense syllables. He found that consciousness of meaning is clearer in the case of nouns than in the case of adjectives and verbs, and that the retention of the former is correspondingly better. The author believes that the *Teilmethode* has not yet been shown to be more economical than the *Ganzmethode*.

Piéron (42, 43, 44) established the curve of learning and the curve of forgetting in the pond snail. Since the latter curve did not coincide exactly with that obtained by Ebbinghaus in the human subject, Piéron set himself the task of memorizing series of nonsense syllables, and found a confirmation of his own formula. He concluded from his experiments that the fixing of memorial traces continues after the stimulus has ceased to act, and that the duration of this fixing process varies widely in different animals. Where fixing progresses slowly, forgetting also progresses slowly.

(f) *Affection and Memory*.—Henderson (16) points out that in the simplest form of learning—trial and error—those movements which have disagreeable consequences are eliminated. We banish disagreeable reactions; do we really forget our disagreeable experiences? Ten observers were asked to record incidents from their lives, and to grade them into classes on the basis of their affective values. While his results show that remembrances are dominantly agreeable, the author does not believe that his query is to be answered in the affirmative. Peters (41) asked a number of reagents to respond to a stimulus-word by the reproduction of a past experience, and then to describe the affective coloring of the original incident and of the remembrance, together with details as to dates and frequency of recall. Fifty-two per cent. of the experiences were described as pleasant, recent experiences being less pleasant than earlier experiences. Individual differences were found in regard to preponderance of pleasant or unpleasant, and in regard to the constancy of the affective tone which attaches to a given experience in its successive revivals in memory.

Claparède (8) discusses the question as to whether an affective process can be an object of memory. Disagreement among psychologists is due to a failure to come to an understanding as to the definition and criteria of memory, and to a misapprehension regarding the significance of the evidence which they bring forward in support of their positions. The author differentiates the various functions or phases of memory, and concludes that only in the case of one of these, recognition, has the existence of affective memory been established.

(g) *Recognition*.—Alrutz (2) describes several remarkable experiences which consist in the false recognition of an acquaintance, but which are invariably followed a few minutes later by a meeting with the acquaintance who had been falsely recognized a few minutes previously. He discusses the various possible explanations of these phenomena, and concludes with the statement that in his opinion the telepathic hypothesis furnishes the most probable explanation,—*i. e.*, the acquaintance who is not yet within the range of the observer's vision is already perceived in vague fashion through the medium of a telepathic sense (!). Alrutz requests his readers to furnish him with additional reports of cases of false recognition.

Katzaroff's paper (25) contains a valuable classification and discussion of theories of recognition. His experimental procedure consisted in exposing a series of pictures, and in subsequently exposing a second series where the original pictures appeared among others of a similar character. The observers were asked to report whether or not they recognized the pictures of the second series, and if so with what degree of confidence. It was hoped by this means, and by means of the introspective records of his observers to throw light upon the process of recognition. The author concludes from his experiments that the process of recognition is a product of two separate and distinct factors, a feeling of familiarity, which constitutes pure or direct or immediate recognition, and the arousal of images or remembrances which confirm or control the immediate recognition and transform the latter into an indirect or mediated recognition. Recognition appears to be an affective rather than an intellectual process; in its pure form it is not determined by any associative process nor by the fusion or juxtaposition of imagery or remembrances. The certainty of one's recognition is independent of one's act of recognizing. Sometimes the former may be determined by the latter, and may follow immediately in its wake; but more often one's certainty develops during the progress of the recognitive process concomitant with the arousal of imagery, remembrances of details, verbal or other associations, and the like. The act of immediate recognition appears to be independent of all feelings or ideas of a precise localization in time or space, or of a precise localization in a constellation of remembrances. There is, on the subjective side, no qualitative difference between correct and erroneous recognitions. The process of recognition manifests such great individual variations that one is led to suspect the existence of typical differences in the mechanism of the process. Katzaroff's paper is followed by an

appendix by Claparède (8) who points out the similarity between Katzaroff's conception of the process of recognition and a view which Claparède himself formulated some years ago, as a result of certain pathological observations. This view makes relationship with the self (with *me* and *my* experience) the essential principle upon which recognition depends. The author assumes that mental associations are of two general sorts: connections of ideas with one another, and connections between ideas, on the one hand, and that which constitutes the self, on the other. These latter (egocentric) connections may function in a centrifugal direction,—constituting voluntary recollection,—or in a centripetal direction,—constituting recognition. Claparède illustrates and supports his view by citations from pathological observations.

Meumann (36) has observed in the course of his investigations with nonsense syllables that the feeling of unfamiliarity is much more definite than that of familiarity, *i. e.*, we are much more clearly conscious of the fact that an impression is unfamiliar than of the fact that another is familiar. Unfamiliarity is provided with a peculiar index or character which makes us aware of the unknown immediately and directly without the interposition of any act of reflection. It possesses the following characteristics: an inhibition of the motor and ideational processes; the consciousness of a blank; the feeling of unpleasantness; an absence of the ordinary reproductive flow of ideas. The experience of familiarity may come to consciousness in various stages or degrees: as the easier flow of mental processes, which gives rise in turn to characteristic feelings and organic sensations; as a lesser tension of attention; as a more ready flow of reproduction. Sometimes all of these criteria of the familiar are lacking, and still the conviction of familiarity arises, apparently as the result of physiological facilitation; but it seems more probable that even here a minimum of dimly conscious criteria have sufficed to give rise to the idea of familiarity.

II. INTELLECTUAL PROCESSES

Binet (5) differentiates emotions and intellectual acts as follows: Both are attitudes. But the attitude is emotional when it is accompanied by intensive organic sensations; and the more intensive its corporeal concomitants, the less doubt is there concerning the emotional nature of the attitude. The attitude is intellectual when it is accompanied by a minimum of subjective sensations and a maximum of objective sensations and images; it is less corporeal,

less material, apparently more worthy of pure mind. Intellectual phenomena seem to be less personal and more general; they are colder, farther removed from pleasure and pain. Emotions are more corporeal, more individual, more characterized by pleasantness and unpleasantness. To transform either attitude into the other, we need only change the group of concomitant organic sensations. Divest the attitude of its organic concomitants and you have left nothing but an intellectual act; clothe this intellectual act in a garb of organic sensations and you have an emotion.

Aveling (3a) aimed to determine: (1) What influence is exerted upon the sensorial content of percepts by the thought-processes which are involved in perception? (2) What influence is exerted upon the thought-character of perceptions by the sensorial content of percepts? (3) What influence is exerted by antecedent conscious processes upon the sensorial content and the intellectual character of perceptions? Colored pictures of familiar objects were presented tachistoscopically; and an attempt was made to predetermine the observer's perception by instructing him to perceive the picture, in one case as an individual thing, in another case, as the type of a class of similar things. In a series of control experiments, the observer was not instructed as to his mode of perception. The results show that in these control experiments, where no attempt was made to predetermine perception, the "individual" and the "type" perceptions occurred with equal frequency. Under "type" instruction, "type" perceptions occurred in seventy-five per cent. of the cases; and under "individual" instruction, "individual" perceptions also occurred in seventy-five per cent. of the cases, a fact which shows the degree to which a given consciousness may successfully be predetermined. The fact that the same picture is perceived in symbolic fashion by one observer, and in asymbolic fashion by another furnishes a basis for the classification of observers into types, since they seem, in the one case, to be in the presence of a real object, and in the other case, to be in the presence of a mere picture. This difference between observers seems to be due to different degrees in the facility with which previous experiences are assimilated into the present perception.

In Kakise's investigation (24) words and phrases were presented, in auditory or visual fashion, with a view to obtaining an introspective description of the conscious concomitants of understanding. It was found that the characteristic constituents of the meaning of a word or phrase are not selective experiences; they are rather a series of phases of a process of reproduction. If many such associations

of related past experiences are reproductively aroused, the result is a feeling of richness of content; when the number of reproduced associations is small, a feeling of poverty of content results; if there are no associations, a feeling of no content arises. This feeling of content, which is the awareness of the more or less fused aggregate of incipient associations, seems to be irreducible to specific imagery. The frequency of imagery in the understanding consciousness is primarily conditioned neither by the concrete or abstract character of the stimulus-word, nor by any peculiarity of the individual, but by the rapidity of his response. When the reaction-word came slowly and with difficulty, imagery tended to intervene; when reaction was prompt, imagery tended to be absent. The author is convinced that the association-method, as customarily employed, is too artificial to give satisfactory results; the *Ausfragemethode* seems to be better adapted both to the study of the general laws of association and to the study of individual peculiarities of association.

Hollingworth (18) suggests that the failure of certain individuals to find that sensory components are present in their consciousness of relation, of intention, of purpose, and the like, may be due to the fact that they seek for relevant imagery. His own introspections convince him of the existence of thoughts whose character represents an intermediate between "the conventionally costumed idea and the nude relational process"; and he cites illustrations to show that three stages of this vicarious functioning may be differentiated. "The first stage includes dream states in which images quite irrelevant as to source or quality may be seen to play a symbolic or metaphorical rôle in the play of meanings, relations and complications of situation which make up the plot of the dream. The third stage is shown in the common observations that the vehicle of a waking meaning, the two poles of a relation, may be fragmentary, transitory, and only remotely relevant, relevant only by virtue of accidental association. The second stage is an intermediate one disclosed by observations of drowsiness hallucinations, a stage in which the thought process is a sensible and adequate waking affair, although the sensory content of consciousness may be evident dream material or even actual sensory impression of a quite foreign character."

Jacobson (20) investigated the perception of single letters, the understanding of words, and the understanding of sentences, employing the "method of examination." His observers were required to furnish two reports of each experience—a description of their conscious processes, and a statement concerning meanings, objects,

stimuli, and physiological occurrences. No imageless processes were reported; and he found that the correlated meanings and processes are two renderings, from different points of view, of one and the same experience.

Koffka (27) reports having asked a "catch question," in consequence of which a latent *Einstellung* was produced in his auditors, a fact which was shown by their changed attitude toward a second question. The author describes methods of investigating the laws of the latent *Einstellung*, and discusses the relation between this phenomenon and the *determinierende Tendenz*.

Clarke (10) attempted to analyze a number of typical *Bewusstseinslagen* by a method which consisted in obtaining introspections regarding the processes involved in learning to read type for the blind; in the understanding of the meaning of words, sentences, paragraphs; in the answering of questions, requiring and not requiring thought; and in the filling out of broken sentences ("rule of three"). It was found that the conscious attitude instead of being a mental ultimate is, in numerous instances at least, capable of being further analyzed, especially in the light of its genesis. When the attitudes occur often enough for generalization, there is found a marked agreement between different observers, and between the same observer's attitudes at different times. This is true of such attitudes as surprise, seeking, doubt, hesitation, uncertainty, all of which may be described in typically different terms. The same observer may report a graded series of transitions in his imagery, from vivid and explicit images to the vague and condensed consciousness which may be supposed to be analogous to that which has been called "imageless thought." Attitudes may, then, be analyzed into sensations, images and feelings, or their genesis may be traced to these elements.

Betz (4) cites illustrations to show that recognition may be a product not of imagery but of "*Einstellung*." Perception is ordinarily attended by a reaction which is essentially organic, kinæsthetic and affective in character. The subsequent reproduction of this reactive complex may serve to represent the perceived object in consciousness, and to give rise to a process of recognition. This revived complex is (inappropriately) called *Einstellung*, by Betz, in contradistinction to *Vorstellung*. The author refers our consciousness of similarity and identity to these organic, kinæsthetic and affective vestiges of original perceptions; and in a second paper, he invokes the same principle (together with the *vorgestellte Einstellung*) to explain the origin in consciousness of our concepts, our general ideas and our definitions.

III. PRACTICE, HABIT, TRANSFER

Foster (14) undertook to make a qualitative and quantitative determination of the relationship which obtains between "native" (or unpracticed) and practiced ability to evoke images of sensory experiences. Pictures, objects, and nonsense drawings were shown to three observers, whose immediate reproduction was then tested by their drawings or descriptions of the material. Practice was continued for three months. It was found that ability to reproduce increased with practice, rapidly at first, then more slowly; but in not a single instance did practice improve the ability to visualize or even increase the tendency to visualize. The improved efficiency in reproduction was found to be due to the following factors: increased confidence in ability to perform the task, and consequent increased attention to the task; increased familiarity with the material; the adoption of a more systematic procedure and a more economical distribution of attention during the act of learning; the discovery of subsidiary aids, such as counting, grouping, naming.

Kent (26) investigated the possibility of habit formation in dementia *præcox*. The procedure consisted in an attempt to obtain effects of practice. Eighteen women, representing various stages in the progressive development of the disease, were asked to practice a series of exercises for a period of several months. The exercises consisted in arranging a series of fifteen digits in a prescribed order, in tracing a path through a (printed) labyrinth, in crossing out digits, letters and geometrical figures. A second series of exercises consisted in placing pegs in holes in a board, and in fitting wooden blocks into a form-board. The records of the errors and of the times required for these exercises show that it is possible for the dementia *præcox* patient to acquire new habits as the result of practice, and that the results attained in one sort of exercise make themselves felt in other exercises of a similar motor sort.

Wells reports an investigation of the effect of practice upon the free association (53). He employed six normal observers; and the procedure consisted in obtaining reactions to one thousand stimulus-words,—twenty sittings, fifty reactions at each sitting,—and subsequently in obtaining a second set of reactions from the initial part of the original list of stimulus-words. It was found that the association-time tended to decrease toward a limit of approximately six fifths of a second; that the responses became further differentiated and generalized as a result of the increased readiness with which the reagent's whole vocabulary became available; that the forms of association

became more superficial; and that the emotive value of the associations decreased. The author mentions the fact that this last result diminishes the applicability of the association-method for any purpose where emotive value is involved.

Sleight (49) investigated the problem of the transfer of training in memorial acquisition. His procedure consisted in making an initial test of memorial ability (first "cross-section"), and then in practicing his observers in memorizing for a period of three weeks, when a second "cross-section" was made. Then practice was resumed for another three weeks, and a third "cross-section" was taken. His tests and his practice consisted in the memorizing of prose, poetry, nonsense-syllables, tables of arithmetical and geographical data, and in learning the "substance" of prose, and the like. His observers were divided into three groups; and the procedure was such that no group was tested by means of the same sort of material which had been employed in its training exercises. The results show that there appears to be no general memory improvement as the result of practice, nor any evidence for the hypothesis of a general memory function; that there would seem instead to be a very large number of related and unrelated memory functions; that the factors which contribute to the transfer of memorizing power are similarities of a fundamental nature, such as specific forms of attention, imagery, rhythm,—in short, similarities of procedure.

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MEMORY, CONCEPT, JUDGMENT, LOGIC (THEORY)

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It will be recalled that Bergson distinguished clearly between memory as recollection, or memory proper, and memory as habit, which merges into perception. An attempt to view the world *sub specie memoriae* without making this distinction clear is to be found in an article by Moede (11), who proposes memory as a comprehensive principle of unity, a cardinal concept of psychology extended to biology and thence to the inorganic sciences. The resulting mnemonic *Weltbild* includes the persistence of matter, which is the possibility of repeated sensation, the laws of nature as the recurring relationships between inorganic bodies possessing memory, and in the organic world the principle of heredity, the idioplasmic memory of the germ-cells, which is not only the foundation of recapitulation and regeneration but also of the functions of the special organs and even of conscious memory which is an offshoot of that idioplasmic memory. Spirit itself, according to one view cited, is the eternal memory of things. It is the summation of all the different stages of memory. I am failing to do justice to the heavy apparatus of learning which is deployed in behalf of this comprehensive view, and to important qualifications. The question persists, however, as to whether the psychical characteristic of memory is not poured out with the bath in the attempt to flood the universe with memory.

Jesinghaus (6) gives an historical and critical review of the following theories of memory: the theory of "petites perceptions," the "Spur" theory (both of which presuppose in the interest of causal continuity the existence of latent psychical elements between the original and the recalled experience), and the theory of "dispositions." The last, as originated by Leibnitz and further developed by Wundt in analogy with the formation of physiological habit, is espoused by the author. The theory of "perseveration" and of "perseveration tendencies" originated by G. E. Müller is criticized as superfluous and untenable.

The literature of the doctrine of imageless thought has been critically canvassed by Angell (2) and the different questions involved disentangled and analyzed. Due credit is given for the stimulus to a keener and more searching analysis of thought-processes than any previous generation has known which the influence of the advocates

of this doctrine has afforded, but the doctrine is found open to suspicion on the following points (quoting in part from the conclusion of the article): (1) The method of its experimental investigation is at least not wholly satisfactory in meeting the demands of ordinary experimental procedure. (2) Imageless thought seems with many observers to be at best but a sporadic and occasional phenomenon. (3) It seems almost impossible to describe it save in negative terms. (4) We are apparently asked to recognize two generically different kinds of thought-material to serve one general function. This is at variance with our conceptions of the parsimony of nature. (5) There are many well-recognized conscious states which may obviously be readily confused with imageless thought. The consciousness of attitude springing out of very primitive physiological attitudes is an important case in point. (6) The presence of interpretative factors in perception gives no real comfort to belief in imageless thinking.—Angell concludes that "the only demonstrably imageless thought is subconscious and so primarily a matter of cerebralistic physiology. Even this would be imaginal if it got above the limen."

Ogden (12), summarizing forty-nine articles bearing more or less directly on the doctrine of imageless thought, reaches a conclusion more favorable to the doctrine than Angell, although the up-shot of the matter seems to turn on an act of faith rather than on fact. "Those of us who believe that meaning is a conscious factor, directly given in our experience, find it unequivocally described in our introspective data, despite all errors of *Kundgabe* which may creep in. Those, on the other hand, who believe that meaning is a logical concept, which can be psychologically observed only in terms of sensory 'vehicles,' obliterate the *Kundgabe* from their reports and direct attention on the sensations and images which may be present." Ogden is unable to see that the experiments of the latter give much promise of the possibility of working out a psychology of thought in terms of sensory symbols.

Jacobson (5) replies vigorously to a criticism by Ogden and asserts that as the result of investigations described by him "we find that wherever there is meaning there are also processes, and we find that the correlated meanings and processes are two renderings, from different points of view, of one and the same experience."

Keyser (8) describes an interesting illustration drawn from the study of higher mathematics which is intended to show the limitation of the imagination as compared with thought. It is demonstrated that symmetric interpretations of a mathematical expression

possible for thought are beyond a certain point impossible for imagination. Thought looks about in spaces of ever-increasing dimensionality like a binocular being with its two-fold vision unimpaired, whilst the eyes of imagination not only fail as *n* mounts higher and higher but fail in unequal measure. Keyser appears to be conceiving of the imagination in terms of visual imagery, or at least in terms of images corresponding to the sense-perception of tridimensional space, and of the rather obvious limitations of images of this sort in dealing with space involving more than three dimensions. He does not consider the problem as to whether thought operates with or without some form of imagery.

The controversy between Alexander (1) and Stout as to whether presentations are mental or non-mental appears to involve the common assumption that the distinction is a purely descriptive, not a functional, distinction. Alexander states the view that sensations and images are both non-mental, objective, and that only conation and feeling belong to the mental sphere. Stout replies that the criterion of the physical is that of occupying space and entering as a factor into a spatially conditioned system, and that the criterion of the non-physical is that of being bound up with our existence as conscious beings. Conceivably, either Alexander's or Stout's view may be agreed with as it is exhibited. But it is not made clear why either view was or may be *taken*.

Betz (3) attacks the traditional doctrine that the concept is formed through abstracting the common element from a number of more or less similar cases. Psychological analysis shows that a concept may arise from a single case, and that the collective ordering of various cases under one concept is a subsequent affair.

Lloyd (10) sets forth the following general principles of antithesis: (1) Mutual reproduction. Each term is relative to the other, not merely by contrast, but intrinsically. Each has in its heart the nature of the other. Each reproduces the other. (2) Duplicity of meaning. Each term has a local, narrow, one-sided meaning, and also a meaning big and deep enough to take up both sides into itself. (3) Identity of opposites. An identity which means a "becoming," in which opposites are not reconciled, but sharpened. (4) Serial mediation. A mediation between the terms which heightens the difference even more than a cataclysmic leap could possibly do, as to be always dying even while living is no ordinary death, and as to be always living even while dying is no ordinary life. (5) Difference at once in kind and in degree. Gradation and continuity are some-

times falsely taken as synonyms, as when it is said difference in degree but not in kind. Gradation must also mean real difference, the realest sort of difference. (6) Dimensional difference. The terms of any antithesis are qualitatively different, yet functionally related. So are the dimensions of space. (7) Parallelism in all difference. Not mere occasionalism but a process of qualitative change incident to serial mediation.

The underlying logic of antithesis is that of differences which are all the more different because they are the same, because they are serially mediated and functionally related in an on-going movement or process. In other words, the logic of antithesis is that of organic unity.

The "new law of thought" discussed by Jones (7) may be stated as a *law of identity in diversity* with reference to the fundamental judgment-form, *S is P*, identity of extension, or denotation (*Bedeutung*), in diversity of intention or signification (*Sinn*). There are no more ambiguous words in philosophy than identity and difference, none more elusive. The source of the ambiguity lies in two fundamental kinds of sameness: (1) extensional, or denotational, sameness, and (2) qualitative sameness. The second is frequently but not always a sign of the first. For example, if a stowaway is observed to have all of the published characteristics of an escaped criminal, the similarity is regarded as an indication of "identity." It may, however, turn out to be a case of "mistaken identity."

Klein (9) agrees with the statement of the law as identity in difference in its application to affirmative predication, but takes exception to Jones's application of it to negative predication, as "difference of Denotation (Otherness) in difference of Intension (Diversity)." Negative predication should be interpreted as asserting neither a *difference in difference* nor an *identity in difference*, but a *difference in identity*. Logicians have failed to do justice to the implication of identity between subject and predicate in negative predication, to the relevancy, amounting to a partial identity in intension.

Russell (14) presents in clear, brief, and comprehensive form some of the net results of his work in the logic of mathematics. He concludes: (1) Mathematical logic has resolved the problems of infinity and of continuity and has rendered possible a solid philosophy of space, time, and motion. (2) Pure mathematics may be defined as an ensemble of propositions which are expressed exclusively in terms of variables and logical constants, in other words, which are purely

formal propositions. (3) The possibility of a knowledge of mathematics refutes both empiricism and idealism, since it shows that human knowledge cannot be deduced entirely from types of sense experience, nor can *a priori* knowledge be explained in a subjective or psychological manner.

In a book which is conceived in the manner of the school of William James and which runs "thick," not to say turbid, with illustrations and metaphors drawn from a wide range, Boodin (4) discusses the relations of truth and reality as an introduction to the theory of knowledge. The book is itself a living illustration of the definition of thinking which it advances, "a matrix of relations, reading forward and backward and throbbing with will—not the pale ghost of the formal proposition or syllogism, which, however important for the effectiveness of thought's procedure, are only its artificial tools." The act of judgment which involves a specific problem and a specific context, and which is always purposive, is the core of all thinking. That part of the book which seems most relevant to the topic of this summary is that which discusses the presuppositions of thinking, for the ego in willing to think—"both because it is practically useful and because it provides ideal sport"—"also wills to accept the formal conditions without which thinking would become impossible" (p. 157). These presuppositions or laws implied in all thinking are: (1) the law of consistency; (2) the law of totality; (3) the law of duality, or the presupposition of the subject-object relation; and (4) the law of finitude.

In a discursive and suggestive study of the part played by analogy in artistic and scientific thinking Read (13) gives especial attention to the analogy of relations where there is no similarity between the respective terms involved. What are the psychological conditions of originality in thought and imagination? Genius consists in an unusual power of "thought by analogy." Sensitiveness to analogy that distinguishes genius is apparently supported by extraordinary power of registering experiences, perhaps without consciously attending to them, or but slightly noticing them. Fear of convention, of authority, discourages the play of analogy. There are ages in which every sort of censorship, conventional, traditional, authoritative is relaxed, so that every man breathes more freely, is more himself, and genius is relatively abundant.

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GRAPHIC FUNCTIONS

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The year's work on graphic functions is dominated by the pedagogical interest.

Miss Thompson (8) presents an excellent résumé of the researches bearing on the history and pedagogy of writing, without attempting any original contribution to the subject. A chapter on the historical development of the alphabet is followed by a summary statement of the experiments that have been made on the psychology of writing. A neurological analysis of the writing act is first given and the views of Mosso, Flechsig, Exner, Collins, and Pierre Marie stated.

Among others, the following experimental studies are reviewed: those of Bryan and of Gilbert on rapidity of movement; of Woodworth on the accuracy and control of voluntary movement; of Downey on sensory control of writing; of Fullerton and Cattell and of Münsterberg on causes of inaccuracy in movement; of Johnson, of Swift, of Bryan and Harter, and of Book on practice and habit; of Judd and of McAllister on the movements used in writing; of Gesell on the relation of accuracy in writing to school intelligence and sex.

In a final chapter on the pedagogy of writing, Miss Thompson attempts a practical application of experimental results to the teaching of writing. Thorndike's scale of handwriting is described and portions of it reproduced.

Superintendent Wilson (11) of Connersville, Indiana, reports the application of the Thorndike scale to the evaluation of the quality of writing of an entire school system. A sudden advance in quality was found to occur at the sixth grade. A test of the relation between quality of writing and training for speed showed that speed may be secured without a sacrifice, to any degree, of quality of writing.

Ayres (1) presents a new scale for measuring the quality of handwriting of school children, a scale which differs from that of Thorndike in that the quality of each sample of writing was determined by its degree of legibility as shown by accurately timed readings made by ten investigators. Professor Thorndike's scale, based on "general merit," is held to permit less exact valuation.

Ayres' scale consists of eight samples of handwriting, which become progressively better by equal steps from left to right. Each of the eight divisions is represented by writing in three slants, vertical, medium, and extreme slant. A given sample may be measured by sliding it along the scale to a sample of the same quality and slant which bears a number representing the value of the writing.

As regards the relation between legibility and the general appearance of handwriting, it was found that legible writing is always of good appearance but that the converse is not necessarily true. The crowding together of words on the line or the too close spacing between lines are, often, causes of a low degree of legibility, facts of importance in connection with the choice of a system of penmanship.

Starch (7) proposes a method of measuring handwriting by means of a graphometer scale which measures the mean variation of the slant of letters and their mean variation from the base-line, a method held to be more accurate than the method of direct comparison with standard specimens.

Discussing some issues in the teaching of handwriting, Freeman (3) raises several questions. First, as to the preferability of vertical or slant writing. Since, as the writer shows, slant-writing is not irreconcilable with a hygienic position, this question must be decided on the score of ease and rapidity of movement and of legibility of writing. Theoretically, vertical writing is most legible, but only slightly more so than writing of a moderate slant. On the other hand, slant writing excels in ease and rapidity as shown by an analysis

of the movements concerned. Secondly, should the child be trained at one and the same time in form and in correct habits of movement? To attempt this may result in a scattering of attention. Moreover, since the development of motor skill comes at the age of eight or nine years, it is a mistake to give the child of six or seven a drill for which he has not yet developed sufficient motor control. The perception of form should be early developed while movement drill may be deferred until the child is in the third or fourth grade. Third, should finger movement or arm movement be taught together or separately? It is probably well to allow the child to follow at first his natural inclination to use the finger movement, deferring the use of the arm component in conjunction with the finger movement until the child has developed motor control. Fourth, should letters or words be used at the beginning of the writing drill? Neither should be used exclusively. Fifth, what form of movement is preferable? The arguments advanced for the use of arm and of finger movements are rehearsed, with the conclusion that the most favorable type of movement combines the use of the arm, of the wrist, and of the fingers.

Freeman (4) also discusses certain problems and methods of investigating handwriting. One of the most important problems is the effect upon quality of an emphasis upon the speed of writing or the effect upon speed of an emphasis upon quality. The writing lesson should be so conducted as to emphasize one or the other of the two characteristics. Again, how does writing develop at different ages? How do speed and form change from grade to grade? Are there times when there is a marked increase in the capacity for rapid writing? The relative advantages of arm movement and of the combined arm and finger movement might be determined by seeing that two groups of children were taught exactly alike except for this one feature. There must be uniformity in the method of measuring the speed and quality of writing. Speed may be measured by finding how long it takes the child to write a certain amount or by finding how much is written in a certain time. For the measurement of quality of writing Ayres's method of grading legibility is recommended.

An exposition of the Montessori method of teaching writing is given by Warren (10). The distinctive feature of the method is the emphasis given to touch and to the kinæsthetic sense.

An interesting résumé of the influences affecting handwriting and a statement of the problems that need investigation is contributed by Näcke (5). Sceptical of the determination in any detail of the character significance of handwriting, Näcke devotes himself chiefly

to the question of the identification of handwriting and the extent to which individual features persist in spite of changed conditions. Using as a text the attempt of Frau Thumm-Knitzel to settle the Shakespeare controversy by a detailed comparison of the authenticated signature of Shakespeare with the writing of other important documents, the author urges that in attempting any identification by such means much writing material of different periods and of differing content must be utilized, for individual variation may be very great, especially in the case of highly gifted individuals. The influence of age on writing must be noted. On account of eye changes, in old age script often becomes smaller and poorer. Cases of clear firm writing in old age deserve special consideration. The kind of pen and paper used; the condition of the writer, whether warm or cold, fatigued or fresh; the speed with which he writes; the formal or informal contents of a given document are important factors. Above all, the influence of race upon handwriting deserves consideration. The author recognizes the persistence of writing individuality through many changes of conditions, so that left hand writing resembles right hand writing and the mirror scripts of both hands resemble each other and the normal script. Even in pathological cases similarity to the normal hand may persist for a long time and such similarity may be found in mediumistic writing even when there is intentional or unconscious imitation of the writing of another.

Näcke raises the problem of handwriting and of inner speech in dreams, urging the need of further investigation. There are, it appears, a motor and a visual type of writing dream. In the first instance, the dreamer himself writes the thoughts which he reads; in the second case, he reads the printing or writing which he sees before him.

As a transition from a reflex activity to a conscious one, the drawings of infants merit the attention of psychologists. Bechterew (2), writing from this point of view, protests against the attempt to interpret the acts of children as significant of the thoughts and feelings of adults. He insists upon a wholly objective interpretation of childish drawings which inform us of a mode of reaction which constitutes a part of their psychic reaction and ought to be judged only in relation with the factors which have determined them, such as hereditary influences, motor coöordination of the fingers, and the like.

Bechterew's report concerns in particular the development of the drawing capacity in two children, with supplementary observation on a number of other children. Among other things the study con-

cerned itself with the following points: the greater or less regularity of the lines evidencing the motor coördination of the fingers; the greater or less complexity of the drawing; the greater or less agreement of the drawing with the material object; the manifestation of creative activity in the representation of the different parts; the elaboration of the subject; the exactitude or the inexactitude of the perspective; the peculiarities of the drawing relevant to the special conditions of education and environment. The development traced showed a general parallelism with the evolution of drawing among primitive peoples.

Van Gennep (9) reports a number of tests on the drawing capacity of a little girl of five years. Although copies were set for the child, she manifested a strong inclination to throw her attention upon the object represented. The experiment showed that the execution of geometric outlines or of alphabetical signs was extraordinarily difficult for the child; the realistic representation of such objects as a chair or a lamp very easy. This result is of significance in the interpretation of prehistoric drawings and the drawings of semi-civilized peoples and in line with the conclusion of those investigators of primitive art who have shown that, in origin, art is realistic and that geometric and conventional drawing is a later development.

As abstract ideas are posterior to concrete ideas, so ornamental designs are the product of abstraction. The alphabetical sign is the last term in a long course of development. To teach first the drawing of isolated letters is, according to Van Gennep, to invert the natural order of development which begins with the representation of natural objects.

Sargent (6) presents a valuable discussion of five problems in the experimental pedagogy of drawing. First, how far does special talent in drawing consist primarily in an unusual interest in the pictorial aspect of objects and to what degree may a lack of such interest be compensated for by an emphasis upon aspects of objects related to other interests of children? Second, what value pertains to the following methods in teaching the representation of objects involving common geometric shapes—drawing directly from objects; theoretical study of perspective; developing concepts of solidity? Third, is there any psychological reason for the reduced size of drawings made naturally by a child and does this size bear any ascertainable relation to the size of the retinal image? Fourth, what habits of expression are developed by rapid sketching? By carefully finished drawings? Fifth, to what degree does each of the following methods

promote the child's drawing ability: detailed observation of objects and comparison of the drawings with the object; study of pictures, including copying or tracing; modeling in plastic material; seeing a skilful draughtsman draw the object under consideration; memory-drawing?

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VOCAL FUNCTIONS

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"To the enthusiasm of the eighties and nineties has succeeded a stagnation, a retrogression, even, in experimental phonetics," says Poirot (15), in the preface to his volume on Phonetics, in Tigerstedt's monumental *Handbuch der physiologischen Methodik*. Some of the foremost champions of the science have passed away; others have devoted themselves to other studies. And the younger generation has not grown up to their measure. The present situation will not be essentially bettered until the philologically trained phoneticians have made friends with the experimental methods and shared in the

labors of the experimental school. What is most needed today is a series of minute investigations of detailed problems, to evaluate and control the earlier results achieved by the method of observation. It is not sufficient that the philologist seek the collaboration of a scientist: the philological and the experimental schools must be united. Whoever utilizes experiment must master the experimental methods.

Poirot's manual aims to make this thorough mastery of the experimental methods easier. It differs from the two existing manuals of L'Abbé Rousselot and Scripture in the great pains that have been exercised to make the text clear and simple as well as comprehensive; and in the emphasis upon methods rather than upon results. Only such accounts of achieved results have been admitted as serve to illuminate the discussion of methods, and the selected bibliography of 211 titles contains only references to works significant for the understanding of the methods of experimental phonetics. Three generous chapters are devoted chiefly to the technique of graphic registration of speech movement, and the study of those dynamic and acoustical properties of the air which are significant for phonetics. A fourth chapter of seventy-five pages, on measurements and computations, seeks to smooth the way of the higher mathematics to the neophyte who must thread the maze of Fourier's Theorem. The volume as a whole is distinctly a workable manual.

The problem of the nature and production of vowel sounds we still have with us. Hermann (7) comes to the defense of the Helmholtz doctrine of formants (the doctrine that for each vowel a certain absolute pitch is characteristic) provoked by the assertion of L. Fredericq that the altering of the rate of revolution of a phonograph cylinder does not alter the character of the vowel sounds.¹ Hermann, following several earlier investigators, had twenty years ago obtained unambiguous results of the opposite kind: alteration of rate was found to produce a distortion of the vowel qualities, even to the point of unrecognizability. He has now repeated his experiments with perfected apparatus, elaborate precautions and controls, confirming his early researches and adding new observations. Among these may be noted the generalization that *retarding* the rate of the cylinder distorts the vowel character much more than a corresponding acceleration. An exception is found in the case of high soprano notes. The results as a whole lend confirmation to the view that certain vowel qualities are determined by the presence of both primary and secondary formants, the latter lower in pitch as well as fainter than the ones most easily detected. It is further suggested that

¹ Bericht der VIII. Internationalen Physiologen Kongresses, Wien, 1910.

the pitch of a formant is variable within moderate limits; and that ordinary vocalization pitches these formants near their lower limits: hence the greater distorting effect of retarding a phonographic cylinder, as compared with accelerating its rate.

In a more recently published and more elaborate study of the production of vowels, Hermann (8) amplifies these and his earlier researches, and develops the formant theory still farther. He marshalls objections against the theory that the resonance cavity in producing the vowel character acts merely by strengthening overtones which are already present in the vocal clang, and undertakes instead to account for the generation of formants by the direct action of the air stream on the resonating cavity, which thus serves as an independent source of sound. This, of course, is no unique doctrine as applied to whispered vowels. Its distinctive feature is found in the theory of the manner in which the formants of vocalized sounds are generated. It is Hermann's view that each sound-wave of the vibrating air sent out from the larynx serves as a separate blast to actuate the resonating cavity. Studies of the acoustics of reed-pipes and new experiments in artificial vowel synthesis based upon the results here obtained have convinced Hermann that such a view is not merely tenable but necessary. Further confirmation is found in an analysis of speech-sound photographic records made with a stentor-microphone and a capillary electrometer, a method which has distinct advantages over the more usual one of enlarging phonographic tracings. Analysis of these vocal records also serves to substantiate the author's position that in addition to the pitch of the formants there are other distinguishing characteristics of certain vowels, and perhaps of all vowels.

Gutzmann (5) brings additional confirmation of Hermann's doctrine regarding the generation of formants, as a result of his analysis of vowels artificially made by combinations of reeds and resonating chambers.

Weiss (22) has used a soap-film phonoscope to record whispered and lightly sung vowels, for contrast with the curves of louder tones. He recognizes that the chief technical difficulty in all such investigations as these is the elimination of damping and sympathetic vibration of the diaphragm. Without achieving complete success in meeting this problem he nevertheless secures some extremely interesting curves which show that, in the records of the vowels U, O and A at least (continental sounds), the formant vibrations are of uniform amplitude in the whispered and lightly sung vowels, while with louder singing they wax and wane in amplitude with each pulse

of the primary tone vibration. No attempt is made to point out the bearing which these facts may have on the doctrine of Hermann, mentioned previously. Weiss has succeeded in getting records of sibilants in which the vibration frequency of *Sch* was found to range between 3,000 and 4,500. With *Ss*, the frequency rose to 6,000 and more a second.

Glover (4), studying the production of vowel sounds, has made observations of the vocal breath vapors simultaneously emitted from the nasal and buccal cavities. Normally the vowels give a buccal vapor but no nasal vapor: throughout the whole extent of pitch and in each variety of voice the posterior nasal orifice is closed. The presence of the consonants M and N either initial or final (French) produces a nasal vapor; but this diminishes in passing from grave to acute. It is impossible for a soprano to articulate *an*, *on*, etc., on a high note. The soft palate particularly, but also the other organs of articulation, undergo an evident influence from the variations of laryngeal tonicity. There is an organic and functional harmony between the activity of these organs. Hence the need in vocal training of emphasis on precision in articulation, since the process of articulation exerts an influence on the laryngeal note and the two are co-ordinated. This leads to a new conception of vocal registers: they are infinite in number. They shift and vary with all the attitudes of the soft palate and the other organs of word formation. These multitudinous registers may be classified into grave and acute, with a region of especial difficulty in the activity of the organs of verbal formation around *re³* (293 v.d.), *me³*, *fa³* (*d'*, *e'* and *f'* in our notation). Voices should be classified according to (1) the range of laryngeal tonicity and (2) possible range of articulation. Glover's views are supported by observations with a thoracic radioscope and with a new multiple-image laryngoscope permitting lateral examination of the vocal cords, as well as by the breath-vapor method mentioned above.

Marage (10) photographed voice vibrations on a film moving slowly so that the vibrations were not dissociated, but the general form of the consonants was made obvious. He thus obtained evidence confirmatory of one of the common classifications of consonants into (1) nasals, requiring both nose and mouth; and (2) mouth consonants, of which there are three sorts: (a) continuous consonants: the amplitude of the tracing gradually increases from zero (F, S, J); (b) explosives: the amplitude is maximal at the onset, and diminishes (B, D, G, P, T, K); and (c) vibrant consonants (L, R). Further observations on the relation and relative duration of consonants and

vowels lead to two applications: In first teaching children to read, vowels and consonants should be joined and not separated, as in the "Janicot" method. In ridding vocal pupils of an objectionable stroke of the glottis, exercises may well begin with substituting an explosive consonant, as B, for the stroke of the glottis, before the practice-vowel.

Several investigators are turning their labors toward the problems of speech melodies. The practicability of the Marbe smoke-flame method for the study of these delicate variations in pitch is made evident in the contribution of Panconcelli-Calzia (13) whose study of melodies in spoken Italian sentences and Italian poetry is a most promising beginning of a series of researches in the difficult field of speech melodies. Pollak (16), for similar purposes, uses phonographic records mechanically transferred to smoked paper. His study of the final cadence in the German declarative sentence is the first of several researches he is now carrying forward in the Vienna phonographic archives. Stefanini (18) has recourse to microscopic examination of phonographic cylinders, but his interest is not primarily in pitch.

Gutzmann (6) has carried the phonographic method into the realm of child study. He caught the first cry of his new-born daughter, and throughout the first year observed and recorded with the skill of the practical phonetician the development of vocal and articulatory reflexes. His report has a value to students of instincts because of the definiteness and minuteness of its records; and students of musical science will welcome the careful observations on pitch production during the pre-imitative stage of development and the early stages of vocal control.

Urbantschitsch (21) has turned his attention to the problem of the influence of sound sensations on speech. He brings together the findings of many investigators who have studied the motor effects of sounds upon the ear muscle, the tensor tympani, the eyes, the face, the musculature of bodily equilibrium and so on. As he points out, both anatomical and pathological evidence demonstrates that the nervous paths of these sound reflexes generally do not involve the cortical auditory centers, but are more direct. The stimuli of some of these reflexes are intense sounds. Other responses are called forth by faint, even subliminal, stimuli; and in some instances the specific stimulus is a sound of a certain pitch. Urbantschitsch then raises the question whether speech can be reflexly influenced through sound sensations. He cites the literature regarding the reflex effects of sounds on breathing but seems to have completely overlooked the work of Cameron, Seashore, and others on the influence of sounds on

maintenance of pitch in singing. The results of Sokolowsky (17), who found a much greater inaccuracy in singing with auditory distraction than in imitating a tone, may also be cited here.

Urbantschitsch's method was to ask his subject to read aloud without letting himself be distracted by tones and noises conducted now to the right ear and now to the left. The effects were varied, but some disturbance amounting frequently to a stammering, a slowing of the rate of utterance or even a complete stoppage of enunciation was produced by some of the auditory stimuli. Ordinarily the interference increased with the continuance of the stimulus.

J. Meyer's contribution (12) describes and classifies the various voluntary and reflex movements of the ear muscles and describes a peculiar case of pathological connection between utterance and ear-movement.

Dupré and Nathan's *Le langage musical* (1) is the work of two gifted physicians who have concentrated their attention upon the study of aphasias, amnesias and allied mental disorders, with especial reference to abnormalities of the musical consciousness. Language is broadly defined as a means of communicating psychic content. Its reflex origin is set forth, after which follows a description and a theory of normal vocal control through auditory and kinesthetic sensations, as a preface to the main purpose of the volume which is the description of musical abnormalities. Few pages are given to vocal functions as such; many more to the mental processes accompanying and controlling them. Relatively little new material is brought forward by the authors. They have been content with a fluent, simple presentation of conventional psychological doctrine and a general survey of their field with special reference to the facts of musical pathology.

The thesis of Super (19) is that rational thinking may be independent of speech. In support of this position he draws from varied sources, especially from his knowledge of deaf children, their conversation, their actions and the peculiarities of their ways of learning language. Fay's paper (2) is a controversial discussion of an earlier article by Professor Alexander Hill. It is really a defense of the classics, and of their study because they are difficult and because language is a stimulator of thought. Incidentally the reader finds several good observations and comments on naturalness of word orders in different languages.

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SPECIAL REVIEWS

LAUGHTER

Laughter: an Essay on the Meaning of the Comic. HENRI BERGSON.

Authorized translation by C. BRERETON and F. ROTHWELL.

New York: The Macmillan Company, 1911. Pp. 200.

This excellent translation of one of the earlier and more popular of Bergson's writings will doubtless appeal to a wide circle of readers. Unless we are mistaken, however, the arguments, when examined, will be found to be more ingenious than convincing. The main title of the work, indeed, is obviously too broad: laughter is excited not only by the ludicrous, but also by various causes of joy, and even physically, as, *e. g.*, by tickling, by certain kinds of acute pain, and, again, on occasion, by hysterical grief. Nor is it always excited by perception of the comic. It belongs, no doubt, to the general type of reflex acts, but, like others of its class, it is more or less subject to control. The connoisseur of the comic is apt to enjoy the finest flavor of his amusement with a suppressed smile, while the professional funny man, who lacks in no respect appreciation of his own jokes, adds to the merriment by masking his countenance with the blandness of the rustic or the solemnity of the judge. Bergson's essay, then, is not an essay on laughter generally, but on the comic and the laughter excited by it. Its real title is the sub-title.

What, then, makes a thing or a person comic? Why do we laugh? The comic, according to Bergson, has three noteworthy characteristics,—it is exclusively human, for although animals may appear comical, it is only by suggesting the human; it is un-emotional, appealing purely and simply to the intelligence; and it is social, the intelligence perceiving it remains in touch with other intelligences and the laughter it provokes has real or imaginary connection with that of others by a sort of social freemasonry. With these characteristics in mind we are ready for the theory. The particular point, it declares, on which the attention of the group is concentrated when it finds anything ludicrous is a certain lack of elasticity, something rigid or mechanical, an automatism or absentmindedness where life and society require plasticity and adaptation. The centrally comic subject—though it is the last to be treated in the book—is the comic

character. Three things are essential to form a comic character,—unsociability in the performer, insensibility in the spectator and automatism, absentmindedness. The type is *Don Quixote*, with his systematic absentmindedness, "the most comical thing imaginable." The combination of elements found in this case sheds its light over the entire field. The comic spirit cannot, indeed, be imprisoned in a definition. The formula, "something mechanical encrusted on the living," which expresses its essence, is modified as it expands. We substitute the vaguer image of some rigidity or other applied to the mobility of life, or attention is called to the physical in a person where the moral side is in question, or we find the manner seeking to outdo the matter, or the person gives the impression of being a thing, etc. But everywhere the principle is the same, everywhere there is an element of stiffness, absentmindedness, viewed unemotionally by the social group or its representative. And the laughter? The laughter is the social corrective of the mechanism, rigidity, absentmindedness. Such is Bergson's theory.

It is not difficult to find illustrations for the theory; this book is full of them. It is curious, indeed, when once our attention is called to the fact, to observe how many funny things appear to contain the ingredients indicated. We had not thought that it was the unemotional perception of something rigid in the living that caused us to laugh, but Bergson makes us see that, whether or not such is of the essence of the comic and whether it be true or not that our laughter is the means appropriated by society for its correction, the rigidity, at least in many cases, is there, or the comic fact can be interpreted plausibly as though it were. Evidence and explanation are, nevertheless, not quite convincing. We remember that the comic on any theory involves some kind of incongruity and, since it is met with preëminently, if not exclusively, in things human, we are not surprised to find numerous cases in which the special incongruity appears as a sort of rigidity or automatism in contravention of the plastic demands of life. But is this always the case? Well, there is at least one class of cases in which the interpretation seems forced, namely the witticism, or joke. Bergson devotes part of a chapter to the comic in words. The witty or comical saying—there is no essential difference—has the power, he says, of rapidly sketching and evoking the image, dim or distinct, of a comic scene. The scene evoked is comic on its own account and conforms to the general principles enunciated for the comic in situations or actions. But the word or saying evoking it is also held to be comic. How is this

explained? As the projection on the plane of words of the comic in actions and situations. The rigidity, mechanism or absentmindedness which is found in them is now found as infecting language itself. An illustration will make this clearer. "He is always running after a joke," remarked some one of a conceited fellow; and the hearer retorted, "I'll back the joke!" (p. 116). Now we are left to discover for ourselves the element of mechanism in the animated picture of the pursuit, and doubtless each one will find it where it pleases him. But the comicality of the witticism is explained by Bergson as due to the fixing of attention on the material aspect of a metaphor, to the fact that an expression used figuratively is taken literally. And this, no doubt, is partly true. But how is this connected with the principle of mechanism? It is connected by the application to language of the law, primarily applied to persons, that we laugh if attention is diverted to the physical when the moral is in question. Here, then, language itself is regarded as having a kind of moral personality in its figurative use and a physical in its literal; the comic saying is viewed as a lapse of attention, not to—for the wit may surely be presumed to be alive to the meanings of words—but in language. It may be left to the reader to judge the warrant and fitness of the analogy. To the reviewer the principle appears self-attenuated in a metaphor.

But there are other objections. Life, we recall, is not pure plasticity; the living organism has its own elements of rigidity. Social life in particular has its own habits, its conventions, and the mechanization of the individual's life to conform to them is not regarded as comical, a thing to be laughed at and corrected, but rather as something required and approved. The comical person is one who, to be sure under definite restrictions, flouts conventions, the "original," the eccentric, often, it must be acknowledged, appearing to exhibit less rigidity than an effusive spontaneity and abounding energy. The reply, of course, will be that, whatever the liveliness of his mind or movements, his very eccentricity shows lack of plastic accommodation to social requirements and that his oddities carry him on by a kind of physical momentum. Be it so; we can no doubt always discover what we look for. But there is one thing at least which the theory fails to explain. Why is it, namely, that when attention is called to the rigidity encrusted on life, the mechanical in the living, the absentminded, or whatever the phrase may be, we do not necessarily find it comical? The man who is always expressing himself in the same set phrases, the speaker always using the same wooden

gestures,—these are comical figures, according to Bergson, but to us on occasion, and presumably to him also, such exhibitions and a thousand others of different types at which we at times laugh heartily, appear simply dull, stupid, irritating, disgusting, or it may be, pitiable, or pathetic. Even the systematic absentmindedness of Don Quixote, that "most comical thing imaginable," has been known, as the writer can testify, to exert a most depressing influence. There are times when nothing whatever seems funny to us, and then anon we are ready to laugh at almost anything. Why is this? The facts clearly point to the coalescence of something subjective with the objective in the constitution of the comic. What may this be? The only subjective factor which Bergson explicitly recognizes in the major part of his exposition is "insensibility," "absence of feeling." The comic, he says, makes its appeal to pure intelligence; laughter has no greater foe than emotion. Now it is true, of course, that comic laughter is incompatible with serious emotion, but if there is anything certain in the æsthetics of this subject it is surely this, that the comic never appeals solely to the intelligence. On the contrary, to be appreciated, it must either find us in, or surprise us into, the mood of its own humor. And that humor would seem to be, whatever its other characteristics, one of relaxation, or play. Bergson himself, near the close of his discussion, offers us the suggestion of this solution of our question. Speaking of the comic character he says (pp. 194 ff.), he is one "with whom, to begin with, our mind, or rather our body, sympathizes"; "we treat him first as a playmate"; "there is in laughter a moment of *relaxation*"; "comic absurdity gives us from the outset the impression of playing with ideas" and "our first impulse is to join in the game." And the same, he adds, might be said of the other forms of the laughable. Disregarding the expression, "or rather our body," inserted, apparently, to save the face of the theory which had originally excluded "feeling," and therefore sympathy, we seem here to be on the right track. We begin to see that we discover the comic not, as some theories (but not Bergson's) have held, in mere perception of incongruity, or in the shock of surprise, or in the glory of superiority, or in the sudden thwarting of expectation—though these may be among its conditions or accompaniments—but only by a kind of inner imitation in which, momentarily at least, the serious tension of life is relaxed and we become like children at play. Bergson, however, while suggesting this explanation, refuses to regard it as either central or final. Nor does he follow it up with an analysis of the conditions and interre-

lations of the tension and its brusque termination which we find in laughter. All that he says on this subject is that there is always a tendency, deep-rooted in the comic, to take the line of least resistance, generally that of habit (p. 196). And this he judges to be a kind of social infection. He recurs, accordingly, to the view that laughter is before all things a social corrective whereby society avenges itself for the liberties taken with it and seeks to counteract the "poison"; the last word is that, like the foam of the sea, it is sparkling froth with a saline base and its after-taste bitter. This view seems to be too seriously pedantic for universal application. Laughter does not at least seem to be always of the nature of a social "ragging." We not only laugh at, but with, our fellows. Bergson allows that in enjoying a joke it is in most cases difficult to say whom we are laughing at; would it not be truer to say that it is impossible? And if comic laughter has a social function, as it doubtless has, and its spirit is akin to that of play, is it not at least as plausible to find that function in the serviceable relaxation it affords to the strain and stress of life as in the chastisement it inflicts on lapses from its "requirements"?

H. N. GARDINER

SMITH COLLEGE

BOOKS RECEIVED DURING JULY AND AUGUST

MOSIMAN, E. *Das Zungenreden, geschichtlich und psychologisch untersucht.* Tübingen: Mohr, 1911. Pp. xv + 137. M. 4.50.

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DEUSSEN, P. *The System of the Vedânta.* (Authorized translation by C. Johnston.) Chicago: The Open Court Publishing Co., 1912. Pp. xiii + 513.

LOEB, J. *The Mechanistic Conception of Life.* Chicago: The University of Chicago Press, 1912. Pp. 232. \$1.50 net.

BINET, A. and SIMON, TH. *A Method of Measuring the Development of the Intelligence of Young Children.* (Authorized translation with preface by Clara H. Town.) Lincoln, Ill.: The Courier Co., 1912. Pp. 83. \$1.00.

MOLL, A. *The Sexual Life of the Child.* (Trans. fr. German by Paul, E.; Intro. by Thorndike, E. L.) New York: Macmillan, 1912. Pp. xv + 338. \$1.75 net.

TRÖMNER, E. *Das Problem des Schlafs. Biologisch und psychophysiologisch betrachtet.* Wiesbaden: Bergmann, 1912. Pp. 88.

NOTES AND NEWS

THE first number of a new German periodical, *Fortschritte der Psychologie und ihrer Anwendungen*, has just recently come to hand. It is edited by Dr. Karl Marbe, of Würzburg, with the assistance of Dr. Wilhelm Peters, and it professes to devote itself equally to the science and to its practical applications. To quote from the introductory announcement: So wenden sich die "Fortschritte" nicht nur an Fachpsychologen, sondern auch an alle diejenigen Praktiker und Gelehrten, die sich von seiten der Psychologie eine Förderung ihrer Disziplinen versprechen müssen. Bei der besonderen Bedeutung der Psychologie für die Philosophie darf die Zeitschrift wohl auch auf eine freundliche Aufnahme in den Kreisen der Philosophen rechnen.

PROFESSOR IRVING KING'S *The Psychology of Child Development* has recently appeared in a Bohemian translation.

DOCTOR EDWIN D. STARBUCK, Professor of Philosophy in the State University of Iowa, has been granted sabbatical leave for the coming year, and will reside in Boston. He will act for the year as psychologist adviser to *The Beacon Press* in the publication of children's and young people's literature, and especially in the formation of the graded Sunday School curriculum.

H. PIÉRON has succeeded Binet as Director of the laboratory at the Sorbonne. The *Année psychologique* will be continued under his editorship. It will be issued this year by Simon and Larguier des Bancels.

THE August number of the BULLETIN, dealing especially with comparative psychology, was prepared under the editorial care of Professor Margaret Floy Washburn.

THE following items are taken from the press:

DR. JOSEPH JASTROW, professor of psychology in the University of Wisconsin, gave three lectures on "The Sensibilities," "The Emotions" and "The Appraisal of Human Qualities" at the summer session of the University of California.

PROFESSOR MORTON PRINCE has retired from the active duties of the chair of neurology in Tufts College Medical School, and becomes professor emeritus. He is succeeded by Professor J. J. Thomas, now assistant professor of neurology.

MR. WILLIAM McDougall, F.R.S., Wilde reader in mental philosophy at Oxford, has been elected an extraordinary fellow of Corpus Christi College.

GEORGE R. WELLS, Ph.D. (Hopkins, '12), has been appointed instructor in psychology at Oberlin College.

L. R. GEISSLER, Ph.D. (Cornell), has resigned his position as research psychologist in the Physical Laboratory of the National Electric Lamp Association, Cleveland, to become professor of psychology at the University of Georgia. He will organize and direct the new psychological laboratory to be established in connection with the School of Education.

THE board of trustees of Colgate University has created a new office, that of vice-president of the university, and has elected Dr. Melbourne Stuart Read to the office. Dr. Read is professor of psychology and has been secretary of the university for several years.

MR. EDGAR A. DOLL has been appointed associate psychologist in the department of research of the Vineland Training School, Vineland, N. J.

DR. WILHELM WUNDT, professor of philosophy in the University of Leipzig, one of the founders of modern psychology, celebrated his eightieth birthday on August 16, on which occasion a "Wilhelm Wundt Stiftung," amounting to 7,000 Marks, was presented to the university by his students and friends.

DR. GUY MONROSE WHIPPLE, of the School of Education, Cornell University, gave three lectures on "The Training of Memory," "The Psychology of the Marking System" and "The Supernormal Child" at the summer session of the University of Illinois.

WALTER FENNO DEARBORN, Ph.D. (Columbia), recently professor in the school of education of the University of Chicago, has been appointed assistant professor of education at Harvard University.

ANNOUNCEMENT.—The business department of the Psychological Review Company will hereafter be located at Princeton and all business communications should be addressed to PSYCHOLOGICAL REVIEW COMPANY, PRINCETON, NEW JERSEY.

